

IN THE CLAIMS

We claim:

1. A method, comprising:

forming a monocrystalline semiconductor ingot from a crystal seed having a predetermined crystal orientation, the monocrystalline semiconductor ingot having a lengthwise axis; and

slicing the monocrystalline semiconductor ingot at an angle other than 90 degrees to the lengthwise axis to form a wafer.

2. The method of claim 1, further comprising forming the monocrystalline semiconductor ingot from the crystal seed having the predetermined crystal orientation selected from the group consisting of a [100], [110], or [111] crystal plane perpendicular to the lengthwise axis of the ingot.

3. The method of claim 2, wherein slicing the monocrystalline semiconductor ingot at an angle other than 90 degrees to the lengthwise axis further comprises tilting the ingot towards a crystal plane that is not perpendicular to the lengthwise axis of the ingot before slicing the ingot to form a wafer.

4. The method of claim 1, further comprising notching the wafer to form an orientation indication feature at an angle greater than 0 degrees from a crystal plane that is perpendicular to a horizontal surface of the wafer.

5. The method of claim 1, further comprising implanting oxygen atoms into the wafer and annealing the wafer to form a buried oxide within the wafer.

6. The method of claim 1, further comprising forming the monocrystalline semiconductor ingot by a Czochralski method.

7. A method, comprising:

forming a monocrystalline semiconductor ingot from a crystal seed having a predetermined crystal orientation;

slicing the monocrystalline semiconductor ingot to form a wafer, the wafer having a flat horizontal surface; and

marking the wafer to form an orientation indication feature at an angle greater than 0 degrees from a crystal plane that is perpendicular to the flat horizontal surface of the wafer.

8. The method of claim 7, wherein forming the monocrystalline semiconductor ingot of a semiconductor material comprises forming a monocrystalline semiconductor ingot having a face centered cubic crystal lattice.

9. The method of claim 7, wherein the face centered cubic crystal lattice is silicon.

10. A method, comprising:

providing a first semiconductor wafer having a first crystal orientation, the first wafer having an oxidized surface;

providing a second semiconductor wafer having a second crystal orientation that is different from the first crystal orientation;

bonding the second semiconductor wafer to the oxidized surface of the first wafer;
and

removing a portion of the first semiconductor wafer to form a semiconductor-on-insulator wafer.

11. The method of claim 10, wherein removing a portion of the second semiconductor wafer to form a semiconductor-on-insulator wafer comprises grinding the second wafer.

12. The method of claim 10, wherein removing a portion of the second wafer comprises splitting the second wafer along the high stress region.

13. The method of claim 10, wherein providing a first semiconductor wafer having a first crystal orientation comprises providing a first crystal orientation selected from the group consisting of a [100], [110], and [111] crystal plane perpendicular to the lengthwise axis of a first ingot.

14. The method of claim 10, wherein providing a second semiconductor wafer having a second crystal orientation comprises providing a second crystal orientation selected from the group consisting of a [100], [110], and [111] crystal plane perpendicular to the lengthwise axis of a second ingot.

15. The method of claim 10, wherein providing a first semiconductor wafer having a first crystal orientation comprises providing a first crystal orientation of other than a [100], [110], and [111] crystal plane perpendicular to the lengthwise axis of a first ingot.

16. The method of claim 10, wherein providing a second semiconductor wafer having a second crystal orientation comprises providing a second crystal orientation of other than a [100], [110], and [111] crystal plane perpendicular to the lengthwise axis of a second ingot.

17. A method, comprising:

implanting a first wafer with an inert gas to form a high stress region, the first wafer having an oxidized surface, a face centered cubic crystal lattice with a [100] crystal plane parallel to a flat horizontal surface, and a first notch at a [110] crystal plane that is perpendicular to the [100] crystal plane;

providing a second wafer having a face centered cubic crystal lattice with a [100] crystal plane parallel to a flat horizontal surface, the second wafer having a second notch at a 45 degree angle to a [110] crystal plane that is perpendicular to the [100] crystal plane;

bonding the second wafer to the oxidized surface of the first wafer such that the first notch is aligned with the second notch; and

splitting the first wafer along the high stress region to form a silicon-on-insulator wafer.

18. The method of claim 17, wherein the first wafer is silicon.

19. The method of claim 17, wherein the second wafer is silicon.

20. A method, comprising:

modifying device performance on a semiconductor wafer by forming the semiconductor wafer to have a non-standard crystal orientation.

21. The method of claim 20, further comprising modifying the performance of the semiconductor wafer that is part of a semiconductor-on-insulator substrate.

22. The method of claim 20, wherein modifying device performance comprises increasing electron mobility within a transistor channel.

23. A wafer, comprising:

a first monocrystalline semiconductor layer having a first crystal orientation;

an oxide layer over the first monocrystalline semiconductor layer; and

a second monocrystalline semiconductor layer over the oxide layer, the second crystal orientation different from the first crystal orientation.

24. The wafer of claim 23, wherein the first crystal orientation is selected from the group consisting of a [100], [110], or [111] crystal plane parallel to a flat horizontal surface of the wafer.

25. The wafer of claim 23, wherein the first crystal orientation is not a [100], [110], or [111] crystal plane parallel to a flat horizontal surface of the wafer.

26. The wafer of claim 23, wherein the second crystal orientation is selected from the group consisting of a [100], [110], or [111] crystal plane parallel to a flat horizontal surface of the wafer.

27. The wafer of claim 23, wherein the second crystal orientation is not a [100], [110], or [111] crystal plane parallel to a flat horizontal surface of the wafer.

28. A wafer, comprising:

a substrate having a face centered cubic crystal lattice and a horizontal crystal plane of the lattice that is not a [100], [110], or [111] crystal plane.

29. The wafer of claim 28, further comprising a buried insulator layer.
30. The wafer of claim 28, wherein the substrate is silicon.